THE AMERICAN JOURNAL
OF
OPHTHALMOLOGY.

VOL. XXIV. SEPTEMBER, 1907. No. 9.

ORIGINAL ARTICLES.

ON THE MUSCULUS DILATATOR PUPILLÆ.*

By Adolf Alt, M.D.
ST. LOUIS, MO.

A number of the more recent text-books on ophthalmology speak of the dilatator muscle of the pupil as an undoubted and definitely proven entity. Some even give illustrations which plainly show that the author has never seen the actual conditions. There are usually two well and equally developed layers of epithelial cells on the posterior surface of the iris which are separated from the iris tissue proper by one layer or several layers of spindle cells which run from the iris periphery to the sphincter pupillæ. The illustrations look so nice and simple, and from the appearance of the tissues it is so easy to recognize what is intended to be shown, that any one not particularly well acquainted with the subject must indeed wonder why so much time should have been wasted in studying and writing and fighting about the existence or non-existence of this dilatator muscle, when everything about it is apparently so plain.

Yet, that such drawings and descriptions are probably not representing the true relations, and that there must be peculiar conditions which do even to this day not allow of an absolutely final decision, although we seem to be very near to it, may become clear even to the uninitiated, when remembering that K. Muench, in a paper in Graefe's Archiv., Vol. LXIV, p 339, could

*Read at the 12th Annual Meeting of the American Academy of Ophthalmology and Oto-Laryngology, held at Louisville, Ky., Sept. 25th to 28th, 1907.

state that up to 1903 no less than 216 articles had been published which dealt with the anatomical and physiological side of the dilatator pupillæ question, and, up to 1904, no less than 617 in which the clinical and pathological aspects of this question were discussed.

From this statement it is clear that a question which had been studied more or less unsuccessfully by so many ardent workers in the field of science, must offer especial difficulties. These difficulties were particularly great before methods had become known by which the pigment contained in the protoplasma of the cells could be bleached and eliminated, and thus an unobstructed view of the cell structures could be obtained.

Quite naturally, the discovery of such methods by Collins, Griffith, Alfieri and others gave a new impetus to the study of the dilatator muscle, and in consequence a further number of papers on the subject have appeared more recently. It may be interesting to consider some of these more especially.

In Knapp's Archiv., Vol. XXXVIII, p. 117, 1898, K. Kiribuchi published a paper on "Studies Concerning the Elastic Tissue in the Human Eye, with Remarks on the Musculus Dilatator Pupillæ." He bleached the iris and then stainel for elastic tissue according to Weigert's method. (In parenthesis, I may say here, that he found the iris tissue free from elastic fibres, except along the bloodvessels and in the interstitial tissue between the fibres of the sphincter pupillæ, statements, with which the results of my own examinations agree perfectly).

Concerning the dilatator he says the following: "The so-called limiting membrane (*Bruch's Grenzmembran*) which lies in front of the pigment epithelium layer is stained slightly blue, by Weigert's method, like the musculus sphincter pupillæ, while other so-called elastic membranes, like Descemet's or the hyaloid membrane of the choroid (lamina vitrea) are stained deeply, just like elastic fibres. Since this stain is an absolutely elective one it follows that the limiting membrane of the iris must be of a nature which differs from the elastic membranes. According to Henle, Merkel, Luschka, Jeropheeff and others, this limiting membrane consists of unstriped muscular fibres, while their antagonists, Gruenhagen, Hampeln, Schwalbe, Michel, Koganëi, Fuchs and others describe it as a structureless vitreous membrane with elastic properties or as a tissue midway between elastic and connective tissue. According to my (Kiribuchi's) examinations, the limiting membrane is not an elastic membrane; yet,

as is well known, the posterior part of the iris is more elastic than the anterior one, and since when the pupil dilates, the limiting membrane is not thrown into folds, it must possess a great degree of elasticity. Since, furthermore, a wide dilatation of the pupil cannot be explained by the simple contraction of the blood-vessels, and since there is no other organ besides this limiting membrane to which a pupil dilating force could be ascribed, this membrane, if it is not elastic, must be muscular. Like K. Grunert, I could see in my bleached specimens which were stained after van Gieson, or with 3 per cent. hæmatoxyline, a layer of spindle cells with long rod-like nuclei. It seems, therefore, that a dilatator muscle is present in the iris."

A number of the more recent writers do not hesitate to declare, like Kiribuchi, that the limiting membrane (*Bruch's* Grenz membran) is undoubtedly the dilatator pupillæ. However, the descriptions which they give of the conditions as they appear to them differ so materially in essential points, that it looks as if, paradoxical as it seems, a better opportunity to see had actually increased the difficulties and made things worse confounded.

A. Szili, Jr., has been fortunate enough to have sufficient fœtal material at his disposal to study the development of the muscles of the iris. The results of his extended studies are published in a paper (Beitrag zur Kenntniss der Anatomie und Entwicklungsgeschichte der hinteren Irisschichten, mit besonderer Berücksichtigung des Musculus sphincter pupillæ des Menschen) in Graefe's Archiv., Vol. LIII., p. 459. He comes to the conclusion that "the muculus sphincter pupillæ in man is an epithelial muscle. It develops about at the beginning of the 4th month from the epithelial cells at the turning point of the two leaves of the secondary ocular vesicle." He further states: "The musculus dilatator pupillæ is an epithelial muscle. It takes its origin from a transformation of the anterior layer of epithelial cells of the iris in the seventh month of embryonic life."

No one has so far been able, it seems, to verify or contradict these statements. Yet, the fact that both iris muscles are of epithelial character has, since the appearance of this paper, been tacitly accepted as proven. One point which Szili particularly dwells upon is the question whether one or two layers of epithelial cells cover the posterior surface of the iris. His description and explanation we will return to later on.

Even this apparently simple question is evidently not so easily settled. Grunenhagen, Widmark and others describe a dilatator muscle and two layers of epithelial cells behind it. Grunert thinks that in the adult there is only one layer and that only here and there a few cells of the anterior layer have remained in existence between the dilatator and the single posterior layer. Heerfordt states that the limiting membrane consists of fibres without nuclei originating from a coalescence of the epithelial cells during fœtal life. Hotta studied this question (Graefe's Archiv., LXII., p. 250) on the eyes of anthropoid apes. He found that the limiting membrane in these apes contains no nuclei, but that the muscular nuclei are, so to speak, adherent to the posterior surface of its fibres, and appear rod-shaped and elongated with a contracted and oval or round with a dilated pupil. He never found two layers of epithelial cells, but doubts the correctness of Heerfordt's opinion according to which the fœtal anterior layer of epithelial cells is transformed into these muscular fibres without nuclei. His own opinion is that the rod-shaped or more rounded nuclei of the so-called anterior epithelial layer must be looked upon as the nuclei of unstriped muscular fibres.

He concludes with these statements: (1) The limiting membrane combined with the nuclei at its posterior surface must be considered as one layer of unstriped muscular plates. (2) What is called the limiting membrane is a layer of the contractile substance of muscle cells or contractile cell plates. (3) The nucleus lies on the posterior surface of and externally to the contractile substance, surrounded by protoplasma. (4) When the muscle is stretched the nuclei approach the contractile substance and vice versa. (5) When the muscular layer is very strongly stretched the nuclei assume the rod-shape and are pressed closely to the contractile substance so that it may appear, as if they were lying within it. When the muscle is contracted the nuclei appear oval or almost round.

G. Levinsohn, in a very elaborate paper (Graefe's Archiv., LXII, p. 547) comes to the conclusion that the posterior surface of the iris is made up of the dilatator layer of closely united unstriped muscular fibres, and two distinct layers of pigment epithelium cells. Juler is of the same opinion, except that he assumes several layers of muscular fibres. Gabriélidès (Archives d' Ophtalmologie, March, 1895,) describes a very similar arrangement in the iris of the chicken. Gruenhagen finds a com-

plete posterior and an incomplete anterior epithelial layer behind the dilatator muscle.

A. von Szili, Jr., in his latest paper (Graefe's Archiv., Vol. LXIV, p. 141,) severely criticizes Levinsohn's paper, before mentioned, and contends that the results of his own developmental researches had marked a decided progress in our knowledge, while Levinsohn's in his opinion are a decided step backwards.

He again refers to the history of the dilatator researches, gives Henle the credit of having been the first to recognize that Bruch's limiting membrane (Grenzmembran) is a muscular organ and divides the different authors and their opinions into five groups:

(1.) Those who assume an elastic membrane in front of one layer of pigmented epithelial cells.—Bruch (Bruch'sche Grenzmembran).

(2.) Those who assume a single epithelial layer and accord to Bruch's membrane a muscular character.—Henle, Merkel and Iwanoff.

(3.) Those who accept two pigment epithelial layers and in front of them a non-muscular fibrillar or elastic limiting lamella which is sometimes described as a structureless vitreous membrane.—Gruenhagen, Hampeln, Boé, Schwalbe, Michel, Eversbusch, Koganëi and Fuchs.

(4.) Those who describe two pigment epithelial layers and give to the limiting membrane a muscular character.—Dostoiewsky, Widmark, and Juler.

(5.) Those who, perfectly aware of the fœtal existence of two pigment epithelial layers, declare that in the adult only one such layer exists.

He then states that this array of names with diametrically opposed opinions, all of them based on thorough work and conscientious research, quite forcefully proves that the histological appearances alone do not suffice for a final settlement of the dilatator question. This final solution can only be seen in the results of his own, previously mentioned, developmental studies. Having tried to prove Levinsohn's statements false, and untenable, he now comes to the following conclusions:

"(1.) The muscle fibrillæ of the dilatator pupillæ in man are formed in the embryo as an intracellular differentiation in the basal parts of the cells of the anterior epithelial layer.

"(2.) The posterior covering of the adult iris in the area of the dilatator consists from within outward (*a*) of one layer of well formed epithelial cells and (*b*) of one layer of oval nuclei surrounded by more or less protoplasma and in front of these a fibrillar layer.

"(3.) Based on the developmental history, we are forced to declare the anterior layer of nuclei and the fibrillar layer in front of it in the adult as closely connected and to call the two together the dilatator pupillæ muscle."

To these references may be added that of a paper by K. Muench (Graefe's Archiv., LXIV, p. 337), who assumes that all of the stroma cells of the iris are of a muscular character.

I am now coming to my own studies concerning the dilatator. When I was a student of medicine we were taught that the muscular nature of the sphincter pupillæ was an undoubtedly proven fact, that the dilatator had as yet not been demonstrated but was "a physiological necessity." But even then some authorities thought they had seen the dilatator muscle, while others as stoutly denied its existence.

In the studies concerning the histology of the human eye which I began during my student's days I was attracted by this problem. However, like others, I was absolutely unable to convince myself of a muscular layer in the iris which might be looked upon as the ardently sought for dilatator pupillæ. The question seemed to be solved by Julius Arnold's opinion that the unusually thick muscular coat of the iris arteries running in a radiary direction from the periphery of the iris towards the pupillary margin, when contracting, would dilate the pupil.

The only tissue which in some way reminded one of a muscular coat was a layer of apparent spindle cells with more or less rod-shaped nuclei which could be seen on the posterior iris surface when the pigment epithelium was gently scraped off. However, these cells contained pigment and with the staining material then in use gave no reaction which would have proven them to be of a muscular nature, nor was their shape exactly as slender as that of unstriped muscular cells elsewhere in the body.

To my astonishment, C. Faber (Der Bau der Iris des Menschen und der Wirbelthiere) in 1876 described these very cells unhesitatingly as the dilatator muscle.

Although I took up the subject a number of times, I always had to acknowledge that I could not find an undoubted dilatator pupillæ.

After T. Collins had introduced his method of bleaching the iris pigment I worked diligently in order to perfect myself in its application and soon succeeded in getting good specimens. Now, I thought, there could no longer be any difficulty in proving the existence or non-existence of the dilatator muscle. (I have since used Alfieri's method with even better results.)

Such bleached specimens show in meridional sections the posterior surface of the iris covered with epithelium which forms two layers at the iris periphery, where it joins the two epithelial layers of the ciliary body, and at the pupilliary margin behind the sphincter pupillæ. (See Fig. 1.) In the intermediate part there

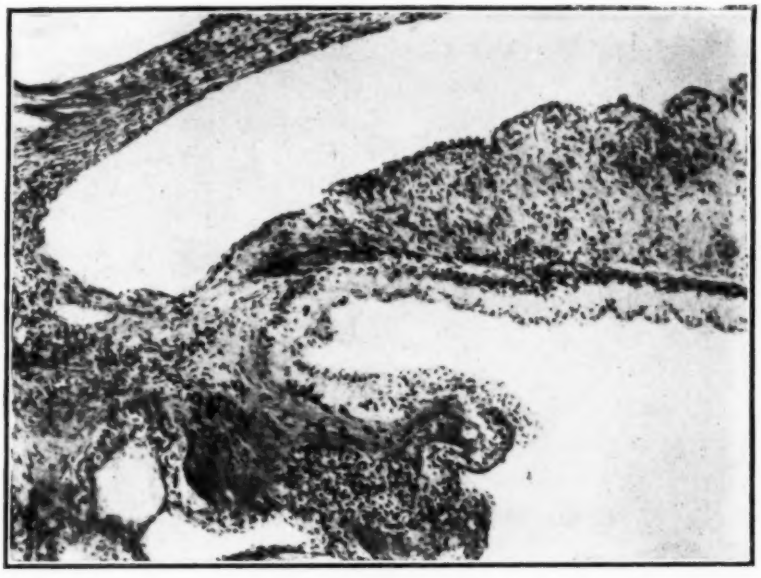

Fig. 1. Bleached iris periphery and ciliary body; two layers of epithelial cells, and in front, separated in specimen, rod-shaped nuclei of dilatator.

are marked differences in specimens from one of the same and from different eyes. There is mostly only one layer, but in different places, more often in some, less in other eyes, a double row of epithelial cells is found. (See Fig. 2.)

If, according to Szili the dilatator muscle is formed by transformation from the cells of the anterior layer of pigment epithelium cells, it is astonishing that in so many places this transformation has apparently not taken place.

In front of these pigment epithelial cells lies a continuous row of spindle cells with a mostly rod-shaped nucleus, which even

when the section is exactly at right angles to the surface appears double or triple, because the nuclei do not always lie at the same level. Yet, sections made on the flat which, if successful, may show larger portions of this layer alone, seem to make it certain that there is only one layer of such rod-shaped nuclei. The outline of the single cells to which they belong I have never been able to produce by the different methods of staining. Yet, not infrequently a separation of the posterior layers takes place by pressure on the cover-glass, and then long

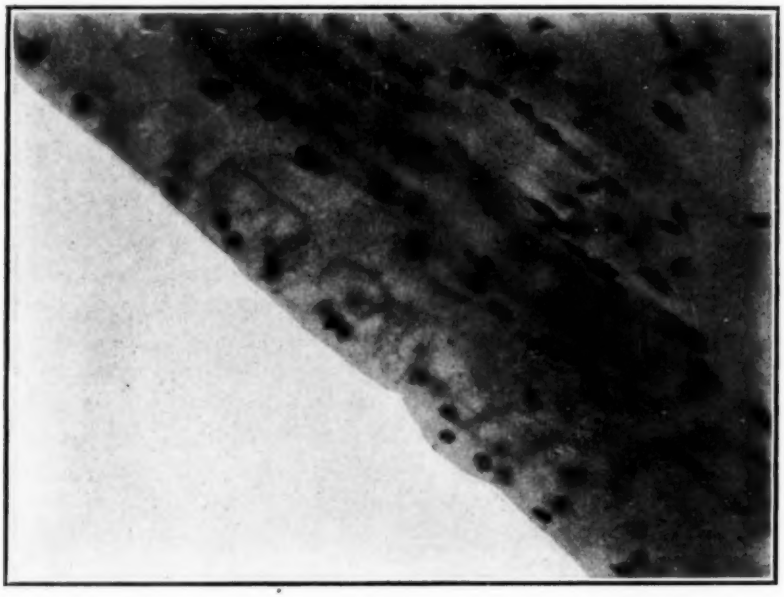

Fig. 2. Bleached. From the part of the iris midway between periphery and pupillary edge. Two distinct layers of epithelial cells, in front of which the continuous layer of rod-shaped nuclei of the dilatator.

slender spindle cells with a rod-shaped nucleus become here and there isolated and visible. (Figs. 3, 4 and 5.) Where there are two layers of pigment cells, in spite of Szili's statement, I always find their oval or round nuclei as well as the rod-shaped ones of the layer in front of them.

In front of this layer of rod-shaped nuclei, when the posterior layers have been split off, a small amount of an amorphous or slightly granular substance is occasionally seen which takes on a little deeper tint; in this, also, I have found invariably some rod-shaped nuclei. It is evidently a part of their layer adhering

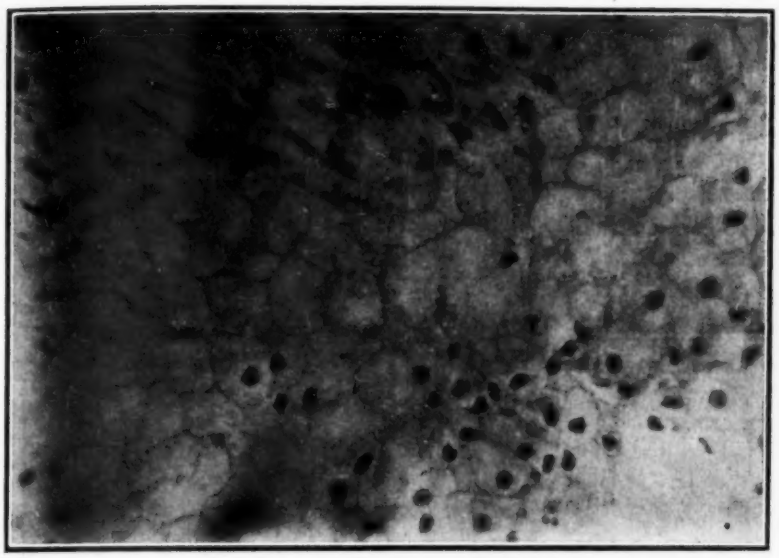

Fig. 3. Bleached. Nearly flat section. Epithelial cells below, rod shaped nuclei of dilatator above.

to the iris tissue proper and I suppose that this corresponds to what Szili describes as the layer of fibrillæ which according to him are formed by an intracellular transformation in the cells of

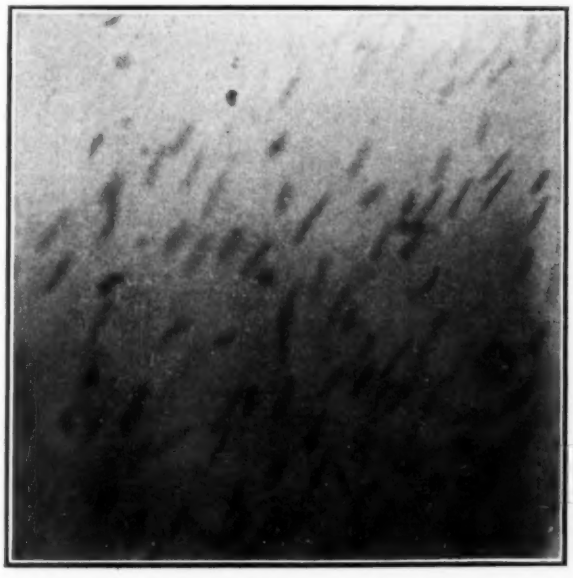

Fig. 4. Bleached. Flat section of dilatator. Rod-shaped nuclei lying at different levels.

the fœtal anterior epithelial pigment layer and lies in front of the nuclei.

The layer of rod-shaped nuclei is closely applied to the anterior pigment epithelium layer except at the iris periphery where it reaches farther outward than the latter and is separated from it by some intervening connective tissue.

Taking all things into consideration, we must probably now affirm that this single layer of slender spindle cells with a rod-shaped nucleus forms the muscular dilatator pupillæ. The peculiar part of it, is the close union of the cells with each other

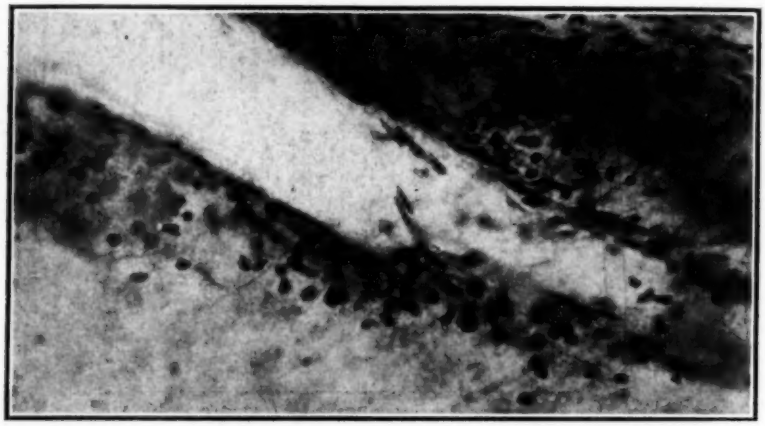

Fig. 5. Bleached. Posterior epithelial layers below, separated from iris tissue above. Several long, slender, spindle-shaped cells with rod-shaped nuclei have become isolated. Dilatator fibres.

so that their outlines are invisible and the individual cells cannot as a rule be recognized.

At the pupillary edge the dilatator joins the posterior surface of the sphincter muscle. At the periphery of the iris, fibres starting from the dilatator spread fan-like out and backwards into the connective tissue of the ciliary body (sometimes I have thought I was able to follow such fibres into the anterior part of the ciliary muscle), or in other sections, such fibres form a more or less sharply defined band which passing in front of the circulus iridis major is lost in the inner layers of the ligamentum pectinatum. (Figs. 6 and 7.) The latter form of tendon, if we may call it so, has been previously described by A. E. Ewing (Graefe's Archiv., XXXIV, part 3), who thought this to be the only form of peripheral attachment of the dilatator and to be confined to the

Fig. 6. Fan-shaped tendon of dilatator. (Accidentally this section shows well the connection of the venous plexus with the meshes of the ligamentum pectinatum).

spaces between the ciliary processes. If his opinion is correct the fan-shaped termination may, perhaps, apply more to the ciliary processes themselves. I have been unable to satisfy myself as to this point.

Granted then that what we have seen and described is the muculus dilatator pupillæ, it appears that it is rather a weak

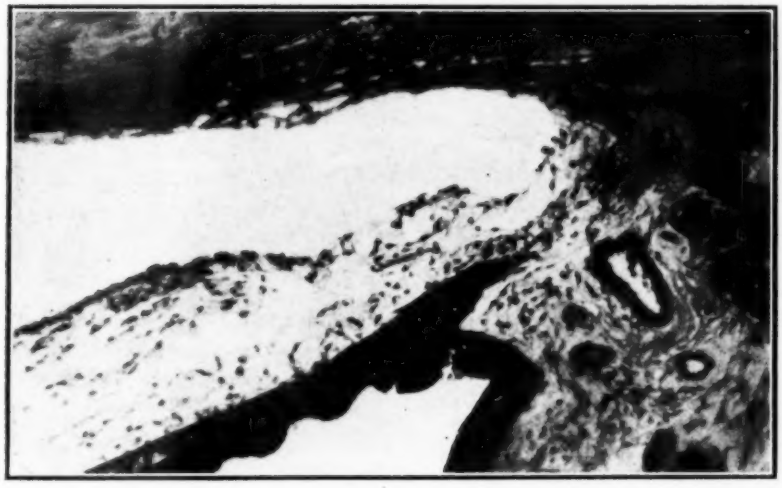

Fig. 7. Band-like tendon of dilatator.

muscle in comparison to the sphincter pupillæ. It seems, therefore, very probable that its action is enhanced by the contraction of the iris arteries and, perhaps, by the relaxation of the sphincter muscles whenever a dilatation of the pupil takes place.

MEDICAL SOCIETIES.

THE OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

Meeting held June 13, 1907.

The President, Mr. Priestly Smith, in the Chair.

CARD SPECIMENS.

Detachment of the Retina, with numerous Cysts, in a Glaucomatous Eye. Epithelial Downgrowth Covering the Anterior and Posterior Surfaces of the Iris.—Mr. L. Werner.

The only clinical history available in this case was that the eye was removed for absolute glaucoma, which was evidently of a secondary nature the result of irido-cyclitis.

The microscopical sections of this case showed a completely detached and much-folded retina containing numerous cysts. There were other spaces in the nuclear layers, but these were not connected with the retinal cysts, which seemed to be formed by the coalescence of neighbouring folds with subsequent disappearance of the intervening septa. The contents of the cysts were fluid. There was some hyaline thickening of the vessel walls. On the anterior surface of the iris was a layer of stratified epithelium somewhat similar to that covering the front of the cornea; this was continued round the pupilliary margin on to the posterior surface, where it became thinner and was ultimately reduced to a single layer on approaching the ciliary body. There was also an endothelial-like membrane behind the lens reflected from the ciliary body. The angle of the anterior chamber was closed. The lens was degenerated. The growth of this epithelium was difficult to explain as there was no history of a wound to account for any downgrowth into the anterior chamber.

Neuro-Fibromatosis of the Fifth Nerve, with Buphthalmos.—Dr. G. Sutherland and Mr. M. S. Mayou.

This case was of a boy, aged 6, who at birth showed some irregular pigmentation of the skin. When six months old, some

small nodules appeared on the back and near the outer angle of the right eye, and at three years old the right side of the face was a good deal larger than the left. The boy appeared delicate, with marked scoliosis; the head was large and square with the bony prominences well marked. The whole of the right side of the head was enlarged, both bones and soft tissues being much thickened. The branches of the third division of the fifth nerve could be felt like cords. The right eye was pushed downward and forward by swelling in the orbit; there was slight ptosis, and enlargement of the vessels beneath the skin of the upper lid, and some tendency to ectropion of the lower lid. The whole eyeball was much enlarged; the cornea was clear, but at the limbus several white streaks passed inwards for 2 or 3 mm. and appeared to be enlarged ciliary nerves. The iris showed *ectropion uveae;* the tension was full, and the disc cupped; the vision was finger counting at 2 ft.

Cases of a similar nature (Fibromatosis of the fifth nerve) have been described before by S. Snell and E. Treacher Collins in the *Transactions of the Ophthalmological Society,* Vol. xxiii., p. 157, by Verhoef in the same place, by Sachsalber in *Beitraege zur Augenheilkunde,* xxvii., p. 523, and again by E. Treacher Collins and R. Batten in the *Trans. of the Oph. Soc.,* Vol. xxv., p. 248.

Leber's Disease; Family Optic Atrophy in Mother and Son.—Mr. Arnold Lawson.

The mother showed optic atrophy of Leber's type in the left eye, while the son presented the same condition in both eyes.

The mother had attended the Royal London Ophthalmic Hospital in 1890, when the vision of the right eye was 6/12, and of the left finger counting at 25 cm.; the note made at that time was that there was pallor and cupping of the optic disc; the fields of vision were not recorded.

The fundus of the left eye at the present time shows much the same changes as at that date, and the right is normal. The peripheral fields are both normal with the exception of slight upward and inward limitation of the left. There is a large central scotoma.

The boy is aged 10, and the vision of the right eye is 6/60, that of the left being 6/36. Ophthalmoscopic examination reveals striking pallor of the temporal half of both discs, more

marked in the left than in the right. The visual fields are normal, and both eyes show a central scotoma for colour.

There is one other child, a girl, who is not affected in any way.

Bilateral (? Congenital) Anaesthesia of the Conjunctiva and Cornea.—Mr. J. B. Lawford.

Lily W., aged 6, came to St. Thomas's Hospital on April 19th, 1907, with the history that the left eye had been inflamed off and on since she was 2 years old. There had never been any serious illness, nor was there any specific history. On the left cornea was a large, shallow, irregular ulcer, but no hypopyon and very little congestion. Complete protection of the eye with pad and bandage and instillation of mydriatic effected a cure in 3 weeks. The special feature about this case was the presence of anæsthesia of the conjunctiva and cornea on both sides, though only the left cornea suffered. Sensation tested with a horse hair with a bending strain of 1,200 milligrammes showed some feeble sensation of the lower, inner, and outer bulbar conjunctiva and of the inferior palpebral conjunctiva. The bulbar conjunctiva of the left eye was entirely insensitive, and the inferior palpebral conjunctiva was also insensitive but less so than the right. There was no loss of sensation in the skin or any other mucous membrane supplied by the trigeminal nerve.

Pemphigus of the Conjunctiva and Xerosis.—Mr. Hosford.

This case was a pemphigus, beginning in December, 1905. At the present time the right cornea is opaque and the eye has only light perception remaining, and the left cornea is becoming invaded. There is a history of several attacks of pemphigus of the skin in other parts of the body.

Traumatic Dislocation of the Lens in Vitreous.—Mr. Charles Blair.

PAPERS.

A History of Night Blindness in 9 Consecutive Generations.—Mr. E. Nettleship.

Mr. Nettleship presented a genealogical tree in which congenital stationary night blindness, without any ophthalmoscopic changes, occurred in nine successive generations extending over a period of 250 years. A great part of the work had been published nearly 70 years; but the fresh inquiry instituted by Mr. Nettleship resulted in the extension of the family tree so

as to include nearly 1,800 people in ten generations. Only certain branches showed evidences of the disease, and just one-half were affected, contained in 60 childships. In half the affected childships (viz. 29) the proportion of the diseased to healthy agreed with the Mendelian theory, while about a quarter of the cases seemed inconsistent with it. The disease always passed from parent to child without a break, was rather commoner in females than males, did not lead to blindness, and was not due to consanguinity.

Mr. Bateman, of Cambridge, remarked that Mr. Nettleship has shown that the disease always descended through an affected person, which fact excited a presumption that the condition was one which, following the Mendelian terminology, might be called a dominant character. By that was meant merely that if a germ cell bearing the character (*e. g.*, night blindness) met a normal germ cell, then the offspring resulting from this fertilization of union would exhibit the character and eventually develop night blindness. Those which did not exhibit the character did not transmit it. The suggestion that night blindness was a Mendelian dominant might be tested in two different ways; the first way was by the simple evidence that it was transmitted only by the affected; and the second test involved the knowledge of large numbers of families which were the offspring of affected persons mated with unaffected. If it were of the simplest Mendelian kind, then the offspring of affected married to unaffected ought to contain an equal number of each. This was not the case in Mr. Nettleship's observations. One point that struck him was that Mr. Nettleship showed that the descent was through affected to affected, whereas previous observers showed descent through unaffected females to males who again developed the defect.

A Peculiar Case of Subretinal Cysticercus.—Dr. L. Werner.

Mr. Werner exhibited coloured ophthalmoscopic lantern slides and microscopical sections of a case of sub-retinal cysticercus. After alluding to cases previously described, he pointed out that in no former record had the opportunity been afforded of an ophthalmoscopic examination together with a microscopical section. The patient, a young man, aged 19, came for advice on November 25th, 1905, with the history of failing sight in the right, first noticed 3 months before.

There was nothing abnormal on external inspection; the tension was normal, and the vision was counting fingers at 1 metre. On ophthalmoscopic examination there was a large spherical tumour 5 or 6 times the diameter of the optic disc situated on the nasal side of the disc and reaching to just above its upper margin. It projected well into the vitreous, and had a bluish-white shiny appearance. The optic disc itself was indistinct and swollen, there was no general dilatation of the vessels, but there was one which was enormously dilated (about ⅓ the breadth of the disc), and this after pursuing a very tortuous course suddenly disappeared into the tumour by a small depression. Situated at the lower and inner part of the swelling was a large hole the depth of which could not be gauged. Towards the periphery was a large detachment of the retina of the ordinary type. The diagnosis was doubtful, and treatment was postponed. The boy left the hospital, and did not return again for 2 months. Vision was then only hand movements, and the peripheral detachment had increased. Under the circumstances the eye was incised; and on microscopical examination the case was found to be one of intra-retinal cysticercus. In sections taken at the lower part of the tumour there was nothing to indicate its place of origin, but higher up the sections revealed clearly in which layer it had developed. What appeared by the ophthalmoscope to be a hole turned out to be a mass of extremely vascular granulation tissue extending from the anterior to the posterior wall of the cyst, forming a pillar of tissue inside the cavity. The vascular supply of this granulation tissue came from the large tortuous vessel before mentioned, which measured 0.27 mm. in diameter. There were no hooklets found, and the diagnosis rested on finding the more or less degenerated remains of the head and neck and a well preserved sucker.

Sub-retinal cysticerci generally perforate into the vitreous; the present one was found in an unusual position, and was probably the cysticercus cellulosæ.

Professor Sattler remarked that several cases had come under his notice, 4 of which he had operated on; and he had 3 specimens showing the head protruding out of the bladder.

(a) *A Case of Metastatic Tumour of the Choroid.*—Mr. Whitehead.

A mammary tumour, which had been present two years was removed seven months ago. Recurrence took place in the scar,

and many metastatic tumours appeared in various parts of the body. Vision in the right eye failed, and after 4 weeks the eye became blind and glaucoma set in. The eyeball was excised, and a flat growth was found in the choroid. Microscopically, the growth was found to consist of closely packed spindle shaped cells and fibrous tissue between irregular groups of tumour cells.

(b) *A Case of Multiple Cysts of the Retina Associated with Glaucoma.*—Mr. Whitehead.

Vision in the affected eye had always been bad, for 3 months there had been complete blindness, and for 2 months glaucomatous symptoms had been present. Examination of the eyeball after excision revealed no intraocular growth, but numerous translucent cysts in the retina, which was not detached. These appeared to be lymphatic cysts, developed within the retina, and separating its layers. The relation between the cysts and the glaucoma was not clear.

In the discussion which followed on these two cases Dr. Rickliffe referred to a case shown by him in 1901, and described its subsequent history. The original injury to the breast was in 1898, the breast was removed in 1900, the left eye was affected a year after this, the right eye 3 months later, and in 3 months the patient died.

Mr. L. Werner described a case of cysts of the retina with glaucoma, but in his case the glaucoma was secondary to iridocyclitis.

Mr. C. D. Marshall considered that metastic carcinoma was probably not so rare as it was supposed to be; it might be present in the later stage and not observed owing to the severity of the general illness.

Mr. Whitehead, in his reply, said that, judging from his own observation, he could not agree with Mr. Marshall's suggestion.

Meeting on July 12, 1907.

The President, Mr. Priestley Smith, in the Chair.

CARD SPECIMENS.

Congenital Opacity of the Cornea in Three Members of One Family.—Mr. Angus McNab.

All three had suffered from bad sight since early childhood, the eldest brother having had "milkiness of the eyes when only a few months old." The family history showed that the mother

had had 16 pregnancies, three of which resulted in miscarriages. Only 6 of the family are now living. Besides the 3 cases under observation one child has posterior polar cataract.

The ocular changes presented by the patients consisted in superficial fine granular spots in the center of the cornea without any trace of vessels, the condition resembling that known as nodular opacity of the cornea.

Symmetrical Changes in Each Fundus.—Mr. Sydney Stephenson.

Abraham S., aged 9, was first seen on June 27th, 1907, with the history that 14 days ago the teacher had noticed the boy could not see the board at school. The vision in the right eye was 5/24, improved to 5/5 with correction, and in the left 5/18, improved to 5/5 with correction. There was a faint zonular cataract in each, and symmetrical changes at the yellow spot. These consisted of an unusually dark granular appearance of the fovea surrounded by a well marked "halo," while the yellow spot itself was pale grey and strongly suggestive of a depression. A coloured drawing illustrated the condition.

Solitary Quiescent Tubercle in the Right Eye Associated with Tubercular Glands in the Neck.—Mr. L. V. Cargill.

A girl, aged 20, came for advice in January, 1907, on account of refractive error. Correction of her hypermetropic astigmatism gave V=6/9 in each eye. On making a routine examination of the fundus there was seen in the right eye a white, somewhat prominent area, a little larger than the disc, and about 1 disc diameter above it. Its surface was sprinkled with some fine specks of pigment, and a small branch of the ascending nasal artery crossed it. At the upper edge there was absorption of choroidal pigment and at the lower edge were one or two spots of pigmentation. There was no detachment, and no other changes, and the fundus and media in the other eye were normal.

The family history showed her to be the youngest of 12, of whom 4 died young, while the rest of the children and parents are living and healthy.

The patient had had six operations for tubercular glands in the neck, and there was extensive scarring in that region. The only other serious illness was congestion of the lungs, in 1895.

A Case of Thiersch-grafting for Symblepharon the Result of Pemphigus—7 Years After the Operation.—Mr. Arnold Lawson.

This case was exhibited before the Society some years ago, and is found recorded in *Transactions,* vol. xxi., p. 157. The left eye has kept quite well, the movements of the globe are unimpeded and the vision is as good as ever, there has been some increase in the conjunctival contraction, but no symblepharon.

In the right eye shrinking had gone on more rapidly so that a second operation had to be performed two years ago; this was followed by complete relief, the vision remaining good.

It was noticeable in this case that the conjunctival contraction had been mostly confined to the lower sacs and lower bulbar conjunctiva in each eye.

PAPERS.

My Combat Against Blindness.—Dr. Fukala (Austria).

This paper dealt with several different eye conditions, such as scleritis, marginal blepharitis, etc., which were treated with much stronger solutions than are usually recommended, the method of application being to paint around the lids, or the sclerotic near the cornea, according to the character of the case, after previously anæsthetizing with cocaine.

Three Cases of Uniocular Optic Neuritis in Boys, with Complete Recovery of Vision.—Mr. W. H. H. Jessop.

The paper described the cases of three boys aged 12, 17, and 14, who developed one-sided optic neuritis with 1 mm. of swelling of the disc; the vision was reduced to finger counting, but subsidence of the neuritis, and complete recovery of normal vision took place in all cases.

No cause could be found in two cases, but in the third two months after the papillitis commenced, an abscess burst and discharged into the rectum. There was a marked central scotoma in each case.

The recovery took place under treatment with mercury ointment, iodides internally, and peacock green glasses; two of them clearing up in two months and one in four months.

In the discussion which followed, several similar cases were mentioned, including one which Mr. Holmes Spicer had seen

many years ago at Moorfields, where even perception of light had been lost in the affected eye with subsequent complete recovery of normal vision. There was 4 D. of swelling of the disc, accompanied by great pain in and about the orbit.

MALCOLM L. HEPBURN.

THE BRITISH MEDICAL ASSOCIATION.

75th Annual Meeting, Held at Exeter, July 27th to August 2d, 1907.

SECTION OF OPHTHALMOLOGY.

The President, Mr. L. H. Tosswell, made some opening remarks, in which he welcomed the Section and pointed out that the West of England Eye Infirmary at Exeter was founded only four years after Moorfields. Dr. E. Landolt (Paris) then opened a discussion on the construction and manipulation of the principal instruments used in eye surgery. He showed several instruments he had himself introduced, and pointed out that the balance of such instruments as knives was usually bad; the blades were too long, and the handles were too long and heavy. Ivory was still the best material for the handles, but aluminum was the next best, and it would stand the heat of sterilization better. Forceps and scissors were also discussed. The President, Lieutenant-Colonel Herbert, Dr. Reeve, and Mr. S. Snell all agreed with Dr. Landolt. Dr. Grossmann said he had found much difficulty in getting curved keratomes sharpened in England. Mr. Jessop thought that no one could sharpen knives better than Weiss. Dr. Landolt having briefly replied, Mr. Simeon Snell read a paper on an inquiry into the causes of blindness in 350 inmates of a blind school. Ophthalmia neonatorum caused more than a third of the cases; the other chief causes were optic atrophy, congenital cataract, and sympathetic ophthalmitis. Mr. Stephenson then proposed the following resolution:

> In the opinion of the Section of Ophthalmology the time has come for the British Medical Association to take action for the prevention of ophthalmia neonatorum.

Dr. Grossmann seconded this. Dr. Cecil Shaw suggested that the measures proposed should be stated. The original resolution

was put and passed. Mr. Richardson Cross having discussed Mr. Snell's paper, Dr. Ernest Thomson raised the question of the comparative prevalence of ophthalmia neonatorum. Dr. Landolt said he had found that in Paris there were much fewer cases of ophthalmia neonatorum than formerly. Dr. John Hern (Darlington) said that the disease was increasing in his district, and that these cases nearly all occurred in patients treated by midwives. Dr. Trotter (Perth) hardly ever saw a case now. Mr. Snell replied and said he found that ophthalmia neonatorum was not diminishing at all in Sheffield. Dr. Hinshelwood agreed with Mr. Cross that ophthalmic surgeons should take up more seriously the question of trephining for relief of intracranial pressure and optic neuritis. Dr. Fish (Chicago) then read a paper on the relation of disease of the nasal accessory sinuses to optic neuritis in which he showed that frequently the neuritis was due to sinus disease. Mr. Pickard and Mr. Bower (Gloucester) agreed with Dr. Fish on this point. Dr. Reber (Philadelphia) thought that ophthalmic surgeons too often neglected to send cases to the nasal surgeons. Most unilateral cases were due to sinus disease. Dr. Chichele Nourse also described some cases in point. Dr. Hill Griffith (Manchester) asked if these cases described by Dr. Fish had a central scotoma and were really retro-ocular neuritis; if so, they nearly got well without treatment. Dr. Fish in reply said that some of his cases were certainly retro-ocular in nature, but many were not. Dr. Karl Grossman described a portable refractometer and astigmometer, and an improved form of artificial eye. Mr. Snell said there was much that was good in Dr. Grossmann's refraction instrument. He had described it many times, and had used it twelve or thirteen years, and even when he described it he borrowed the idea from Dr. Würdemann. Dr. Hill Griffith thought the idea was very old indeed. Dr. Grossmann asserted his claim to being the originator of the modifications in his instruments. The proceedings for the day then terminated.

Thursday, August 1*st,* 1907.

At the second meeting Mr. Richardson Cross opened a discussion on irido-cyclitis, first giving an account of the anatomy and physiology of the ciliary body and then describing the pathological condition found. He then went into the etiology and treatment of the disease and insisted on the use of atropine, and, if necessary, paracentesis could be done; there was, however,

no justification for the use of myotics even if the tension were high. Iridectomy was useful later on, and even if there was plus or minus tension it frequently did good in both conditions. Dr. Landolt had very rarely practised subconjunctival injections and thought that operations were not to be recommended in most cases of irido-cyclitis, as most subsequently did badly. Mr. Holmes Spicer said he had never seen any good result from subconjunctival injection. He had not seen much good result from iridectomy in these cases. Mr. Roper was not in favor of iridectomy in anything but very late cases. He thought that the sooner the patient was got under the influence of mercury the better, no matter what the cause. Iodopin he had found most useful. Mr. Parsons insisted that albuminous material in the aqueous was the chief cause of the increase of tension. He did not agree with paracentesis as a rule unless the tension were very high, and these cases were very rare. Colonel Herbert thought that tapping the anterior chamber was most useful, but he considered that a subconjunctival puncture and counter-puncture had to be made if permanent diminution of tension was to be obtained. Mr. Devereux Marshall insisted on the local use of atropine, and if necessary, paracentesis should be done. Dr. Reber laid stress on the general treatment of the disease, and thought that subconjunctival injections did more harm than good, except in quite the late stages. Dionine was of extreme value. Mr. Hern thought that but little good resulted as a rule from iridectomy. Mr. Richardson Cross replied. Mr. Hinshelwood read notes on four cases of congenital word-blindness in the same family. These cases were exactly similar to others he had previously described. He emphasized the necessity of patience in training. Mr. Sydney Stephenson had seen several cases. He described the case of a girl who suffered from this condition. Mr. Elliott Square, Mr. Holmes Spicer, and Mr. Cyril Walker described cases. Mr. Hinshelwood replied. Colonel Herbert read some clinical observations on spring catarrh, and specially insisted on the presence of eosinophiles. Some of the cases benefitted by the use of salol. Dr. Carruthers and Mr. Parsons thought the disease very rare from their experience at Moorfields, so also did Mr. Pickard and Mr. Richardson Cross. Mr. Hill Griffith described one case, but he could not recall having seen another. Mr. Sydney Stephenson had seen it in conjunction with a recurrent skin affection. The most puzzling cases were those confined to one eye, when it closely

resembled tubercle. Colonel Herbert replied, and said that in his experience the presence of eosinophiles was diagnostic in any case in which the diagnosis of spring catarrh was in any way possible; the evidence was in favor of the disease being of a local parasitic nature. Mr. Hill Griffith read notes of a fatal case of orbital thrombosis without apparent cause. The patient died on the seventh day, but no autopsy was possible. He referred to a case he had published in 1884, and had not seen another during the interval. Mr. Richardson Cross had seen but one case. Mr. Stephenson asked if it were possible that it followed on facial erysipelas.

Friday, August 2nd, 1907.

Mr. Holmes Spicer opened the discussion on vesicular affections of the cornea. He described the anatomy of the corneal epithelium and pointed out how readily it could be detached from Bowman's membrane. He then recounted several characteristic cases, and pointed out the close connection of the herpes of the cornea and of the lips, evidently due to a neuropathic condition of the fifth nerve. He then described such conditions as filamentary keratitis and dendritic ulcers. The patients suffering from the latter condition were usually old or middle-aged, though he had once seen it in a child. As a rule it was sufficient to touch the ulcer with pure carbolic acid, though occasionally absolute alcohol or the actual cautery was required. Relapsing bullous keratitis usually followed a slight injury, and was far more frequent in females; but its treatment was not very successful. He recommended the use of dionine. Superficial punctate keratitis had a great tendency to recur; here also he had found dionine of great use. He showed several lantern slides. Dr. Reeve thought that some dendritic cases were associated with malaria. Dr. Cropper said that in the East it was often associated with trachoma, and he had known the cautery do great good. Dr. Pickard had seen a good many cases of bullous keratitis associated with great pain and produced by slight injury; he suggested that the recurrences might be due to included septic organisms in the epithelium. Dr. de Silva had seen them associated with malaria. Mr. Spicer, in reply, said that he did not think they were due to malaria except so far as that disease lowered the general health. Mr. A. F. MacCallan read a paper on the ophthalmic hospitals in Egypt. He described the origin of the hospitals and the work

done there. The hospitals were of the greatest benefit, and the amount of work done was enormous. Trichiasis due to trachoma was one of the most frequent conditions requiring relief. Snellen's modification of Streatfield's operation was the ordinary one done. Owing to the great ignorance of the natives he thought that it was impossible to stamp the disease out altogether. He showed some very interesting photographs of the hospitals and work done in Egypt. Mr. Richardson Cross congratulated Mr. MacCallan on his excellent work, which must have an excellent effect, not only on the suffering patients, but also from a political point of view. He asked what his treatment of trachoma was. In reply, Mr. MacCallan said his treatment was much the same as is common in this country. He had not had good results from the use of radium. Mr. de Silva described the condition of lepra ophthalmica in Ceylon. Dr. Thomson Henderson read a paper on the pathogenesis of primary glaucoma and the *rationale* of iridectomy. He explained his ideas as to the causation of glaucoma. He considered that the reason why iridectomy did good was because the iris, after it had been cut, never healed, and remained open and acted as a drain. Mr. Parsons said that he thought Dr. Henderson over-exaggerated the action of the absorbing surface of the iris, but that all such ideas as had been enunciated were well worthy of consideration. Mr. Richardson Cross described the original case which first suggested Dr. Henderson's theory of glaucoma, as it occurred in a patient of his. The point of interest was that the angle of the anterior chamber was open. Dr. Henderson replied. Mr. A. C. Roper read a paper on prolapse of the iris in simple cataract extraction. He gave the result of Mr. Bankart's 150 consecutive cases of cataract extraction done at Exeter, and of 152 cases of his own. In his own he had 11 per cent. of prolapses. The incision he always placed within the cornea at the upper part. The early prolapses he excised at once, but he did not think it wise or necessary to excise small prolapses, especially if they took place after the first day or two; if a cystoid cicatrix developed he excised it later on. The President was strongly in favor of simple extraction in straight-forward cases. Mr. Devereux Marshall spoke in favor of simple extraction in suitable cases, but he always did an iridectomy unless the iris went back quite easily. He always excised prolapses. Mr. Elliott Square thought that if for no other reason the cosmetic effect would strongly favor the simple

operation. Mr. Brewerton would never leave a prolapse, as he thought it a most potent cause of sympathetic ophthalmitis. Mr. Roper replied.

ABSTRACTS FROM MEDICAL LITERATURE.

By W. A. Shoemaker, M.D.

St. Louis, Mo.

MODERN VIEWS OF THE PHYSIOLOGY AND PATHOLOGY OF ACCOMMODATION.

Carl Hess (*Jour. A. M. A.*, July 20) gives his views on this subject, arrived at after careful observations and study of the eye during the act of accommodation. To begin with he shows that during the contraction of the ciliary muscle the lens is displaced downward by the force of gravity, demonstrating that the suspensory ligament is slackened during the act of accommodation. This observation is made by first dilating the pupil with homatropin and then instilling a solution of eserin which affects the ciliary muscle before it does the pupil. The displacement of the lens can be seen best where it is opaque as in senile and also juvenile cataract. It can, however, be seen also in the clear lens by looking through a very small opening in a diaphragm placed about 12 mm. in front of the cornea. In this way the very minute normal spots and opacities in the lens can be seen to move during the act of accommodation when the head is in the erect position or inclined laterally toward either shoulder, but not when the head is bent forward so that the iris lies in the horizontal plane. If the eye be moved slightly the lens is seen to be tremulous behind the iris. Where there are capsular opacities these can be seen to move, showing that the whole lens is displaced and not only the intra-lental substance, as Tscherning has supposed. Hess has also disproved the theory held by Schön and Tscherning that the ciliary body was displaced backward by the contraction of the ciliary muscle, thus tightening the zonula. Where an iridectomy has been done the ciliary processes can often be seen behind the coloboma near the equator of the lens. Ten minutes after instilling eserin in such an eye the processes can be seen advancing

toward the cornea and in front of the equator near the anterior surface of the lens.

Another observation of interest and importance is that little tent-like elevations near the equator of the lens at its anterior surface, seen in an eye under atropin and which are caused by pulling of the zonular fibers at the lens surface, are seen to disappear after the use of eserin, showing traction of the zonula in the non-accommodating eye and slackening of it by action of the ciliary muscle. This accommodative slackening of the zonula and the tremulous lens which is present disproves the theory that the pressure in the posterior part of the eye increased during accommodation, while that in the anterior part is diminished. The author also made careful tests of intra-ocular pressure in the anterior chamber with the monometer and found that accommodation had no effect, whatever, on it. These findings have a very important bearing on the question of the effect of accommodation on the production of myopia and glaucoma.

Hess believes that the increased convexity of the lens depends on the age of the person rather than on the amount of contraction of the ciliary muscle. That a given amount of accommodation requires the same amount of contraction of the muscle at all ages. Any patient can contract his ciliary muscle a great deal after the lens has reached its maximum convexity. Increased muscle contraction after the lens no longer responds may bring the punctum proximum somewhat nearer by contraction of the pupil, but in this way only. Hence the theory that the ciliary muscle contracts much more in middle aged persons than in the young is erroneous. This allows the relation between accommodation and convergence to remain the same at all ages, which the author believes to be the case.

From his studies and careful examinations of many thousands of eyes Hess believes there is no such thing as "spasm of accommodation." Neither does he believe that it is possible for a part of the ciliary muscle to contract producing a lenticular astigmatism, and thus neutralizing an opposite corneal astigmatism. Nor does he think that one eye can accommodate more than the other in order to correct anisometropia, but on the contrary, the accommodation in both eyes is equal, even should one eye be blind. He concludes his most interesting article by giving a review of some of the most interesting facts with regard to comparative physiology of accommodation.

POSTOPERATIVE INTRAOCULAR HÆMORRHAGE RESULTING IN TOTAL BLINDNESS AND DESTRUCTION OF THE EYEBALL.

Aaron Brav (*American Medicine,* May, 1907) adds the report of another case of postoperative intraocular hæmorrhage to the seventy-five cases previously reported in medical literature, and discusses the symptoms, assigned causes and treatment of this accident.

The clinical symptoms are characteristic. There are sudden and severe pain in the eyeball, nausea and vomiting, followed soon by free bleeding, the blood soaking through the bandage and dressing if this has been applied. There is no definite time for its occurrence, but it may come on at once after the incision has been made in a cataract operation, before the lens has been delivered, or may be delayed until the third or fourth day after the operation when all danger is thought to be past. It is not caused by faulty technic, as many of the best operators have had it occur. He is convinced that no one factor is sufficient to explain the cause but thinks that high intraocular pressure, partial degenerative changes in the vitreous and an atheromatous condition of the bloodvessels are predisposing causes; and that with these present, psychic influence contributes more than is usually thought as an exciting cause. Believing that there is an element of shock in these cases he recommends the hypodermic injection of morphia immediately before operating on subjects in whom this complication may be anticipated, especially in delicate, ill-nourished and nervous patients.

SOME PERSONAL EXPERIENCES IN THE USE OF ELECTRICITY IN OPHTHALMIC PRACTICE.

W. F. Coleman (*Jour. A. M. A.,* April 27,) reports some of the results of the use of galvanic and sinusoidal currents by him in ophthalmic practice and indicates the class of cases in which the galvanic current is most likely to do good and the class where the sinusoidal is useful. Where pathologic elements are to be disintegrated and absorbed the galvanic current is useful because of its electrolytic property. Hence it should be employed in atrophy of the optic nerve following a neuritis. On the other hand in primary atrophy the sinusoidal current seems more useful as it appears to stimulate the optic nerve more.

He has employed these currents with beneficial results in the following conditions: optic atrophy, vitreous opacities, amblyopia, sequelæ of iritis, intra-ocular hæmorrhage, retinitis pigmentosa, asthenopia, xanthelasma, paresis of ocular muscles, alopecia of the lids, and nictitation. In some cases the recovery was of special note as they had been previously treated by other accepted methods with no improvement.

CATARACTS PRODUCED BY SHOCKS FROM THE COMMERCIAL ELECTRIC CURRENT.

H. Stillson (*Northwest Medicine,* Seattle, Wash., February) reports three cases of opacity of the lens resembling very much such conditions caused by lightning. The cause in these patients was an alternating current of electricity of 20,000 and 30,000 volts. In one patient there was complete loss of sight with no perceptible abnormality of the eyes except that the anterior portion of each lens has opacities resembling small dust particles just beneath the anterior capsule. In the other two cases there were numerous dots and interlacing lines also just beneath the anterior capsule. The eye grounds were normal and vision about four-fifths normal.

A CASE OF EYESTRAIN MISTAKEN FOR APPENDICITIS AND CHOLELITHIASIS.

Ellice M. Alger (*N. Y. Med Jour.,* June 8) reports the case of a young man who several years ago began having frequent attacks of severe, crampy, paroxysmal abdominal pain, generally about twenty minutes after eating but often at other times also. They recurred nearly every day and often several times daily for a number of months. One surgeon diagnosed the case as one of appendicitis and advised operation. A second, made a diagnosis of cholelithiasis, and also advised operation. A third, called to settle the diagnosis and operate for whichever condition he thought existed, detected signs of eyestrain and sent the patient to an oculist who made a careful examination of the eyes under a cycloplegic and prescribed glasses which were worn.

With no other treatment the trouble disappeared entirely and did not return for nearly three years, when, after losing his glasses, he had a recurrence of the attacks. He went to an optician and obtained glasses which were satisfactory so far as vision was concerned but the attacks of abdominal pain were

not relieved. After some months he was referred to the author who found his vision in each eye to be 20/20, and he accepted +.50 D. C. ax. 90° in each eye. The glasses obtained from the optician were O. D. —.25 D. S.⊃+.50 D. C. ax. 90° O. S. +.25 D. C. ax. 90°. Under atropine he accepted O. D. +.75 D. C. ax. 90° giving him 20/15 vision; O. S. +.75 D. C. ax. 90° with 20/15 vision. These were prescribed and six months later he reported that he had not had an attack since wearing this correction and had taken no treatment of any kind.

THE TREATMENT OF LACRIMAL OBSTRUCTION.

Mark D. Stephens (*Journ. A. M. A.*, July 13) divides the apparatus for draining the tears into three parts; the first including the puncta and canaliculi, the second the sac and nasal duct, and the third the opening of the nasal duct into the nose.

Inflammation or abnormalities about the opening of the duct into the nose is a most frequent cause of disease in the other parts of the apparatus, and a careful examination of the nose in the region of the opening of the nasal duct should always be made before beginning the treatment of inflammation of the middle part. Where there is no pus or muco-pus in the sac he carefully dilates both puncta and the canaliculi so that he can pass a small probe. After this, syringing out the sac with some mild antiseptic or astringent is resorted to without attempting to pass the probe down into the nasal duct. If the fluid does not pass down into the nose but flows out of the other canaliculus, by applying a canaliculus clamp more pressure can be used and the fluid often made to pass down through the duct. It may often be necessary to use repeated syringing for a week or more to reduce the inflammation and swelling before the fluid will pass down into the nose. Should there be much pus or muco-pus he advises slitting one of the canaliculi and thorough syringing.

When the fluid cannot be made to pass into the nose after repeated trial it is necessary to use the probe and he prefers a medium sized silver probe, elliptical in shape, and thinks it should not be passed clear through the nasal duct into the nose but only passed into the upper part of the duct as this is the narrowest part and where the stricture is most frequently located. The present tendency to depend more on the use of the syringe than on probes meets with his approval.

As to the radical operation of removing the sac, he gives the views of quite a number of prominent ophthalmologists whom he interrogated on the subject, and gives it as his opinion that the sac should be removed under the following conditions:

"1. When pus or muco-pus can be pressed out of it, unless the disease yields to a reasonable amount of conservative treatment, which does not demand of the patient too much sacrifice of nervous energy, time and money. On account of the danger of hypopyon ulcers, the demand for removal is imperative in those whose eyes are frequently subjected to injury, as farmers, mechanics, stone cutters and lumbermen.

2. In cases in which the dacryocystitis is bilateral and the patient has already lost one eye from hypopyon ulcer, the sac should be removed on the side of the healthy eye.

3. If there is severe ulceration of the cornea with dacryocystitis, or even lacrimal obstruction, it is often advisable at least to incise the sac and drain it, but I do not hesitate to remove such sacs, even during the height of the inflammation, since ulcus serpens must be treated vigorously to prevent perforation and loss of the eye.

4. As a preliminary to operations requiring the opening of the eyeball where dacryocystitis is present. If the fellow eye has been lost by postoperative infection, the necessity of such preliminary operation is imperative. If an immediate iridectomy is necessary for glaucoma, or if for any reason sufficient time is not allowed for healing of the wound before opening the eyeball, it is best, anyhow, to remove the sac completely. Sutures passed around the canaliculi or cauterization of them are poor substitutes for removal of the sac, which should at least be opened and drained if the patient will not permit removal.

5. In cases of chronic lacrimal obstruction without any apparent blennorrhœa of the sac when normal drainage can not be restored, as in many cases of traumatic destruction of the lacrimal channels. In such cases it is safer for the eye to remove the sac, destroying completely the lumen of the remaining connecting channels, especially since it is impossible to know how soon an acute or chronic blennorhœa may replace the apparently simple obstruction and innocent, but often dangerous epiphora. Tooke pointed out that the presence of dacryocystitis is often disguised by a high crest on the lacrimal bone, preventing proper pressure on the sac, and sometimes by the increased pressure forcing the contents of the sac into the nose instead of into the conjunctival sac.

6. When lacrimal fistula is present.

7. In cases in which there is necrosis or disease of the bony wall of the canal.

8. A dilated or atonic sac should be removed, the embracing fibres of the obicularis being atrophied, and especially in long-standing cases with partial destruction of the walls of the sac and duct in which probes have been employed.

9. In certain cases of polypus or when there is much thickening of the sac lining, sometimes indicated by a lumpy feeling after emptying the sac.

10. In debilitated or nervous patients or any who can not endure probing. De Schweinitz considers it especially indicated in the insane.

11. In dangerous conditions, such as tubercle and malignant growths."

REVIEWS.

DER SEHNERV UND DIE NEBENHOEHLEN DER NASE. Beitraege zur Lehre der Kanalikulaeren Neuritis and Atrophie des Sehnerven nasalen Ursprungs.

(THE OPTIC NERVE AND THE ACCESSORY CAVITIES OF THE NOSE. Contributions to the knowledge of canalicular neuritis and atrophy of the optic nerve of nasal origin.) By Professor D. A. Onodi. With 33 illustrations. Vienna and Leipzig. 1907. Alfred Hoelder. Price 6 marks.

The author whose previous researches concerning the accessory cavities are well known, pays especial attention in this monograph to the normal and abnormal relations between the optic nerve and the accessory cavities of the nose. The illustrations which are photographic plates in the natural size of the specimens are truly magnificent. Every ophthalmologist should familiarize himself with this important subject and Onodi's monograph will be of great help to him not only on account of the beautiful illustrations but, also, on account of the excellent clinical observations.

THE REFRACTION OF THE EYE. A manual for students. By Gustavus Hartridge. 14th edition. Philadelphia. 1907. P. Blakiston's Son & Co. Price $1.50.

Fourteen editions in thirteen years may well be considered a proof of the practical value of this manual which we have

had occasion to recommend to our readers numerous times. We need not add anything further.

DISEASES OF THE EYE. A manual for students and practitioners. By J. Herbert Parsons. Philadelphia. 1907. P. Blakiston's Son & Co. Price $3.50.

The number of text books on eye diseases is evidently still growing and gets more and more bewildering. Parsons book is characterized by a clear, concise description which confines itself chiefly to facts and neglects unproven theories, by very good and numerous illustrations, and by his paying especial attention to the more common eye affections. It is a beautiful book and should find a good market.

MANUAL OF DISEASES OF THE EYE. By Ch. H. May. 5th edition revised. With 362 illustrations, 22 plates and 63 colored figures. Wm. Wood & Co. New York. 1907.

May's book besides having reached the fifth edition has been translated into five foreign languages. Such a success which is well deserved must be very gratifying to author and publisher. The slight changes noted in this edition are in the line of further improving this excellent manual. ALT.

PAMPHLETS.

Dionine in Ophthalmic Practice. By K. Grossmann.

The Contamination of the Air of our Large Cities with Sulphur dioxide, the Cause of Respiratory Disease. By Th. W. Schaefer.

Foreign Body of Right Bronchus Removed by Aid of the Bronchoscope. By S. H. Large.

The Safest Method of Using Paraffin Subcutaneously. By S. H. Large.

The Conservative Treatment of Chronic Suppuration of the Middle Ear. By S. Theobald.

Indications for the Employment of Adrenalin Chlorid, in Conjunction with Cocain, in Operations on the Eye. By S. Theobald.

Report of the Ophthalmic Hospital of Cincinnati, O., for the Year 1906.

A Fatal Case of Cryptogenic Staphylococcus Bacteraemia. By C. R. Holmes.